

# PATENT ABSTRACTS OF JAPAN

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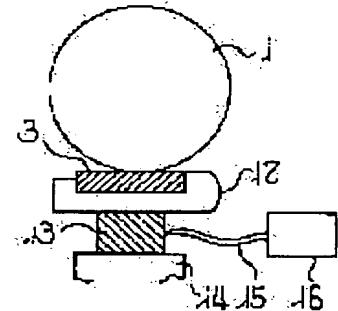
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## (54) PAPER FEEDING-SEPARATING DEVICE

### (57)Abstract:

PURPOSE: To improve the reliability of paper feeding-separating action by adjusting-controlling the pad pressure of a friction pad.

CONSTITUTION: A paper feeding-separating device of a friction pad separating system with a friction pad 3 brought into pressure contact with the outer peripheral surface of a paper feed roller 1 is provided with a piezoelectric element 13 for energizing the friction pad 3 in the direction of adjusting the pad pressure of the friction pad 3.



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## DETAILED DESCRIPTION

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### [Detailed Description of the Invention]

#### [0001]

[Industrial Application] This invention relates to the feed decollator which separates and feeds at a time the form set to the feed location in the state of the laminating to one sheet.

#### [0002]

[Description of the Prior Art] Conventionally, there are various things as a feed decollator used in the feed sections, such as a copying machine and a printing machine, and as indicated by JP,55-135039,A etc. also in it, the feed decollator of the friction pad separation method using a friction pad is adopted widely. Here, the general structure of the feed decollator of a friction pad separation method is explained based on drawing 8.

[0003] First, in bodies of a device (not shown), such as a copying machine, the feed roller 1 is supported to revolve free [ rotation ], and the pressure welding of the friction pad 3 supported by pad equipment 2 is carried out to the peripheral face of this feed roller 1 in the from cartridge. In addition, said pad equipment 2 is attached in the direction which makes said friction pad 3 attach and detach to the peripheral face of said feed roller 1 free [ a slide ] at the coupling device 4, and this coupling device 4 is being fixed to said body of a device. Moreover, while a screw 5 is fixed to said coupling device 4, the nut 6 is screwed in this screw 5, and between the end face of this nut 6, and said pad equipment 2, the coil spring 7 for generating the force (pad \*\*) of carrying out the pressure welding of said friction pad 3 to the peripheral face of said feed roller 1 is infix.

[0004] On the other hand, while containing the form 8 to which paper is fed in the state of a laminating, the sheet paper cassette 9 with which the location close to said feed roller 1 is equipped is formed, and in this sheet paper cassette 9, the bottom plate 10 into which a form 8 is loaded, and the coil spring 11 for feeding made to generate the force (paper feeding pressure) of carrying out the pressure welding of the loaded form 8 to the feed roller 1 are formed.

[0005] In such a configuration, if the rotation drive of the feed roller 1 is carried out in the direction of arrow-head a, the top form 8 will be drawn in between the feed roller 1 and the friction pad 3 in response to the frictional force from the feed roller 1, and one sheet of form 8 will be conveyed at a time inside the body of a device. On the other hand, when two or more sheets of forms 8 advance into coincidence to between the feed roller 1 and the friction pad 3, according to the difference of the frictional force by the difference in coefficient of friction between the feed roller 1, a form 8, and the friction pad 3, the top form 8 is separated from other forms 8, and only the top form 8 is conveyed inside the body of a device. In addition, since pad \*\* is common if coefficient of friction between mu 2, a form 8, and the friction pad 3 is set [ coefficient of friction between the feed roller 1 and a form 8 ] to mu 3 for coefficient of friction between mu 1 and a form 8, and the relation of mu1>mu3>mu2 is materialized, the frictional force which acts between the feed roller 1 and a form 8 becomes max, and feed separation only of the top form 8 is carried out. However, such frictional force is acquired by "coefficient-of-friction x pad \*\*."

[0006] However, pad \*\* required since not only the frictional force between the friction pad 3 and the feed roller 1 mentioned above but the frictional force of the part to which the pressure welding of the form 8 is carried out by the paper feeding pressure of the coil spring 11 for feeding exists, in order for the force of acting on a form 8 to make feed separation perform normally will receive a limit.

[0007] Here, when the relation between the magnitude of pad \*\* and paper feeding pressure and feed separability ability is investigated, it comes to be shown in drawing 9. In drawing 9, a field "A" is a field from which a double feed is started, a field "B" is a field from which non-delivery is started, and a field "C" is a field which can perform normal feed separation. In addition, paper feeding pressure changes with the number of sheets of the form 8 currently loaded on the bottom plate 10, and if this changing range is "b", the proper range of pad \*\* is set to "c." That is, when paper feeding pressure is changed, in order to make feed separation perform normally, it is required to maintain pad \*\* in the proper range "c."

[0008] In addition, adjustment of pad \*\* is performed by turning a nut 6, and compressing or lengthening a coil spring 7.

#### [0009]

[Problem(s) to be Solved by the Invention] If a coil spring 7 will be extended by wear of the pad side of the friction pad 3, pad \*\* may fall and it may separate from the proper range. Moreover, the proper range of pad \*\* is changed

depending on the rise of coefficient of friction on the appearance between the forms 8 by the edge of a form 8 deforming at the time of change of an environment or a condition, for example, the decision by the production process of a form 8, and the paper type of a form 8. Therefore, it is required to change pad \*\*, corresponding to fluctuation of the proper range of pad \*\* in to maintain pad \*\* to a predetermined value \*\*\*\*. Furthermore, even if it changes this proper range to fluctuation of the proper range of pad \*\*, it is required to adjust to pad \*\* with whenever [ allowances / to which pad \*\* falls within a proper range ], and to specifically set up pad \*\* among d1-d2 on the broken line shown in drawing 9.

[0010] However, in the feed decollator of the conventional friction pad separation method, it is difficult to perform adjustment and control of pad \*\* suitably, and when pad \*\* separates from the proper range, the double feed and non-delivery of a form 8 have occurred.

[0011]

[Means for Solving the Problem] Invention according to claim 1 prepared the piezo-electric element which energizes said friction pad in the feed decollator of the friction pad separation method which carried out the pressure welding of the friction pad to the peripheral face of a feed roller in the direction which carries out adjustable [ of the pad \*\* of said friction pad ].

[0012] Invention according to claim 2 formed the paper feeding pressure sensor which measures the paper feeding pressure which makes said feed roller carry out the pressure welding of the form which set the friction pad to the feed location in the feed decollator of the friction pad separation method which carried out the pressure welding to the peripheral face of a feed roller, and established a pad \*\*\*\*\* means to have energized said friction pad in the direction which carries out adjustable [ of the pad \*\* of said friction pad ] based on the measurement result from this paper feeding pressure sensor.

[0013] Invention according to claim 3 prepared the vibrator which vibrates said friction pad in the feed decollator of the friction pad separation method which carried out the pressure welding of the friction pad to the peripheral face of a feed roller.

[0014]

[Function] In invention according to claim 1, by impressing an electrical potential difference to a piezo-electric element, stress occurs in this piezo-electric element, adjustable [ of the pad \*\* of a friction pad ] is carried out by operation of this stress, and adjustment of pad \*\* to proper within the limits which can perform feed separation normally, and control are performed simply.

[0015] In invention according to claim 2, since a pad \*\*\*\*\* means drives based on the measurement result of the paper feeding pressure by the paper feeding pressure sensor, when paper feeding pressure is changed, pad \*\* is automatically changed into proper within the limits which can perform feed separation normally.

[0016] In invention according to claim 3, by making vibrator drive, a friction pad vibrates, and when this vibration gets across to a form, the separability between forms improves.

[0017]

[Example] The first example of invention according to claim 1 is explained based on drawing 1. In addition, the same sign shows the same part as the part explained in drawing 8, and it also omits explanation. The pressure welding of the friction pad 3 supported by pad equipment 12 is carried out to the peripheral face of the feed roller 1, the end of the piezo-electric element 13 which generates the stress which is proportional to applied voltage by impressing an electrical potential difference to pad equipment 12 is fixed, and the other end of a piezo-electric element 13 is being fixed to the fixed part 14 of the body of a device of a copying machine.

[0018] The end of lead wire 15 is connected to the polar zone formed in said piezo-electric element 13, and the other end of lead wire 15 is connected to the adjustable electrical-potential-difference machine 16. In addition, the operation direction of the stress generated in a piezo-electric element 13 when an electrical potential difference is impressed to said piezo-electric element 13 is set up in the direction which pushes said friction pad 3 against said feed roller 1.

[0019] In such a configuration, if an electrical potential difference is impressed to a piezo-electric element 13, the stress proportional to applied voltage occurs in a piezo-electric element 13, and while the friction pad 3 is pushed against the feed roller 1 by this stress, pad \*\* of the friction pad 3 will go up. Therefore, while being able to perform adjustment and control of pad \*\* and maintaining pad \*\* within proper limits by controlling the electrical potential difference impressed to a piezo-electric element 13, feed separation of a form can be made to perform normally.

[0020] And whenever it grasps the relation between the total of feed number of sheets, and the abrasion loss of the friction pad 3 corresponding to it, pad \*\* is maintainable within proper limits by controlling the electrical potential difference impressed to a piezo-electric element 13 according to feed number of sheets.

[0021] Subsequently, the second example of invention according to claim 1 is explained based on drawing 2. First, the pad equipment 2 which supported the friction pad 3 is attached in the direction which makes the friction pad 3 attach and detach to the peripheral face of the feed roller 1 free [ a slide ] at the coupling device 4 like the conventional example explained in drawing 8, and this coupling device 4 is being fixed to the body 17 of a device of a copying machine.

[0022] Next under said pad equipment 2, the lever 18 is attached free [ rotation ] by using the lever shaft 19 as the

supporting point, the base 20 is contacted by the end of this lever 18, and the coil spring 7 for generating pad \*\* of said friction pad 3 is infixed between this base 20 and said pad equipment 2. The piezo-electric element 21 which generates distortion which is proportional to applied voltage on the other hand by impressing an electrical potential difference between the other end of said lever 18 and said coupling device 4 is infixed, and the polar zone and the adjustable electrical-potential-difference machine 16 of this piezo-electric element 21 are connected through lead wire 15. In addition, the distorted direction of the piezo-electric element 21 at the time of impressing an electrical potential difference to said piezo-electric element 21 is set up in the direction which increases spacing of the other end of a lever 18, and a coupling device 4.

[0023] In such a configuration, if an electrical potential difference is impressed to a piezo-electric element 21, a piezo-electric element 21 will produce distortion proportional to applied voltage, and a lever 18 will rotate the lever shaft 19 in the direction of a counterclockwise rotation as the supporting point by this distortion. And while the base 20 is pushed up by rotation of this lever 18, a coil spring 7 is compressed, and while the friction pad 3 is pushed against the feed roller 1, pad \*\* of the friction pad 3 goes up. Therefore, while being able to perform adjustment and control of pad \*\* and maintaining pad \*\* within proper limits by controlling the electrical potential difference impressed to a piezo-electric element 21, feed separation of a form can be made to perform normally.

[0024] And whenever it grasps the relation between the total of feed number of sheets, and the abrasion loss of the friction pad 3 corresponding to it like the example explained in drawing 1 also in this example, pad \*\* is maintainable within proper limits by controlling the electrical potential difference impressed to a piezo-electric element 21 according to feed number of sheets.

[0025] Subsequently, one example of invention according to claim 2 is explained based on drawing 3 thru/or drawing 5. First, the pressure welding of the friction pad 3 supported by pad equipment 12 is carried out to the peripheral face of the feed roller 1 like the example explained in drawing 1, and while the end of a piezo-electric element 13 is fixed to pad equipment 12, the other end of a piezo-electric element 13 is being fixed to the fixed part 14.

[0026] Like the conventional example explained in drawing 8 below, the location close to the feed roller 1 is equipped with the sheet paper cassette 9, and the coil spring 11 for feeding made to generate the paper feeding pressure which makes the feed roller 1 carry out the pressure welding of the loaded form 8 to the bottom plate 10 into which a form 8 is loaded in this sheet paper cassette 9 is formed. Furthermore, between said bottom plate 10 and said coil spring 11 for feeding, the paper feeding pressure sensor 22 which measures paper feeding pressure electrically is formed. This paper feeding pressure sensor 22 is formed of the distorting object 23 formed by hard aluminum etc., two or more strain gages 24 which are stuck on the part which the distortion in a distorting object 23 tends to generate, and measure the deformation amount of a distorting object 23, and the base 25 for distorting object immobilization fixed to the distorting object 23, as shown in drawing 4. Moreover, said strain gage 24 is formed of the resin film 26 and the metal distorted detecting element 27, as shown in drawing 5.

[0027] Lead wire 28 is pulled out from said strain gage 24, and such lead wire 28 is connected to the distorted amplifier 29. Said distorted amplifier 29 is connected to the measurement control section 30 which controls the adjustable electrical-potential-difference machine 16 to impress an electrical potential difference required while calculating pad \*\* required in order to perform feed separation normally based on the signal of paper feeding pressure inputted from the distorted amplifier 29, in order to obtain the pad \*\* to said piezo-electric element 13. And a pad \*\*\*\*\* means 31 to energize the friction pad 3 is formed in the direction which changes pad \*\* of said friction pad 3 based on the measurement result of the paper feeding pressure from said paper feeding pressure sensor 22 with these measurement control sections 30 and piezo-electric elements 13, and the adjustable electrical-potential-difference vessel 16.

[0028] In such a configuration, the paper feeding pressure generated from the coil spring 11 for feeding is changed according to the number of sheets of the form 8 currently loaded on the bottom plate 10, and this paper feeding pressure is always measured by the paper feeding pressure sensor 22. And an electrical potential difference required in order that pad \*\* required in order to perform feed separation normally based on the measurement result from this paper feeding pressure sensor 22 may calculate in the measurement control section 30 and may obtain that pad \*\* is impressed to a piezo-electric element 13. And the stress which is proportional to applied voltage by electrical-potential-difference impression to a piezo-electric element 13 at a piezo-electric element 13 occurs, and while the friction pad 3 is pushed against the feed roller 1 by this stress, pad \*\* of the friction pad 3 goes up.

[0029] Therefore, according to fluctuation of paper feeding pressure, pad \*\* will be automatically changed into proper within the limits which can perform feed separation normally, and its dependability of feed separation improves sharply. If it sets up so that pad \*\* may be especially located among d1-d2 on the broken line shown in drawing 9, when the field "C" which can perform normal feed separation by an environmental variation etc. is changed, feed separation will be performed normally.

[0030] Subsequently, one example of invention according to claim 3 is explained based on drawing 6 and drawing 7. First, three friction pads 33a, 33b, and 33c are supported by pad equipment 32, and the friction pads 33b and 33c of both sides are supported through the piezo vibrator 34 which is vibrator. Said piezo vibrator 34 is formed of longitudinal-oscillation mold piezo vibrator 34a and shearing oscillatory type piezo vibrator 34b, and the drive circuit 35 is connected to these piezo vibrator 34a and 34b. In addition, said friction pads 33a-33c are arranged by

the center of rotation of the feed roller 1, and parallel, and the pressure welding of each is carried out to the peripheral face of the feed roller 1.

[0031] In such a configuration, by making the drive circuit 35 drive, the friction pads 33b and 33c carry out ellipse movement, as an arrow head e shows drawing 7, and moreover, they operate in the part by which the pressure welding is carried out to the feed roller 1 in the hand of cut (the direction of arrow-head a) of the feed roller 1, and hard flow, i.e., the direction which returns the form 8 to which paper is fed to a sheet paper cassette. Therefore, since the friction pads 33b and 33c function as returning the form 8 by which the double feed was carried out to a sheet paper cassette side, its feed separability ability improves.

[0032] Moreover, when the friction pads 33b and 33c draw an ellipse locus and rotate, vibration will be given to a form 8, that adhesion condition is canceled by this vibration and, as for the form 8 which is in the condition that edges stuck at the time of decision, one of the causes of a double feed is canceled.

[0033] In addition, in this example, although the piezo vibrator 34 to which ellipse movement is carried out to the friction pads 33b and 33c was mentioned as the example and explained, feed separability ability improves similarly by arranging piezo vibrator using the piezo vibrator made to generate a progressive wave as vibrator, so that this progressive wave may serve as the feed direction and reverse sense.

[0034]

[Effect of the Invention] In the feed decollator of the friction pad separation method with which invention according to claim 1 carried out the pressure welding of the friction pad to the peripheral face of a feed roller Since the piezo-electric element which energizes said friction pad was prepared in the direction which carries out adjustable [ of the pad \*\* of said friction pad ] It has the effectiveness of being able to raise the dependability of the feed separation with a friction pad by adjusting the applied voltage to a piezo-electric element by being able to perform adjustment of pad \*\*, and control easily, therefore maintaining pad \*\* within proper limits.

[0035] In the feed decollator of the friction pad separation method with which invention according to claim 2 carried out the pressure welding of the friction pad to the peripheral face of a feed roller The paper feeding pressure sensor which measures the paper feeding pressure which carries out the pressure welding of the form set to the feed location to said feed roller is formed. Since a pad \*\*\*\*\* means to energize said friction pad was established in the direction which carries out adjustable [ of the pad \*\* of said friction pad ] based on the measurement result from this paper feeding pressure sensor When pad \*\* of a friction pad can be automatically changed within proper limits which responded to the paper feeding pressure to change, therefore paper feeding pressure is changed, it has the effectiveness of being able to raise the dependability of the feed separation with a friction pad.

[0036] In the feed decollator of the friction pad separation method which carried out the pressure welding of the friction pad to the peripheral face of a feed roller, since it prepared the vibrator which vibrates said friction pad, invention according to claim 3 has the effectiveness of being able to raise the dependability of feed separation while it can vibrate a friction pad and can raise the separability between forms by this vibration by making vibrator drive.

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CLAIMS

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[Claim(s)]

[Claim 1] The feed decollator characterized by preparing the piezo-electric element which energizes said friction pad in the feed decollator of the friction pad separation method which carried out the pressure welding of the friction pad to the peripheral face of a feed roller in the direction which carries out adjustable [ of the pad \*\* of said friction pad ].

[Claim 2] The feed decollator characterized by to have formed the paper feeding pressure sensor which measures the paper feeding pressure which makes said feed roller carry out the pressure welding of the form which set the friction pad to the feed location in the feed decollator of the friction pad separation method which carried out the pressure welding to the peripheral face of a feed roller, and to establish a pad \*\*\*\*\* means energize said friction pad in the direction which carries out adjustable [ of the pad \*\* of said friction pad ] based on the measurement result from this paper feeding pressure sensor.

[Claim 3] The feed decollator characterized by preparing the vibrator which vibrates said friction pad in the feed decollator of the friction pad separation method which carried out the pressure welding of the friction pad to the peripheral face of a feed roller.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the side elevation having shown the first example of invention according to claim 1.

[Drawing 2] It is the side elevation having shown the second example of invention according to claim 1.

[Drawing 3] It is the side elevation having shown one example of invention according to claim 2.

[Drawing 4] It is the side elevation having expanded and shown the paper feeding pressure sensor.

[Drawing 5] It is the side elevation having expanded and shown the strain gage.

[Drawing 6] It is the front view having shown one example of invention according to claim 3.

[Drawing 7] It is a side elevation.

[Drawing 8] It is the side elevation having shown the conventional example.

[Drawing 9] It is the explanatory view having shown the relation between the magnitude of pad \*\* and paper feeding pressure, and feed separability ability.

[Description of Notations]

1 Feed Roller

3 Friction Pad

8 Form

13 21 Piezo-electric element

22 Paper Feeding Pressure Sensor

31 Pad \*\*\*\*\* Means

33b, 33c Friction pad

34 Vibrator

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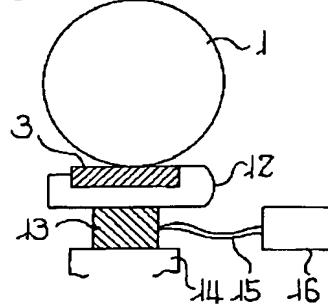
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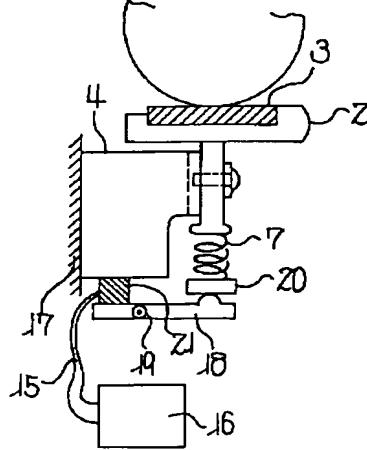
DRAWINGS

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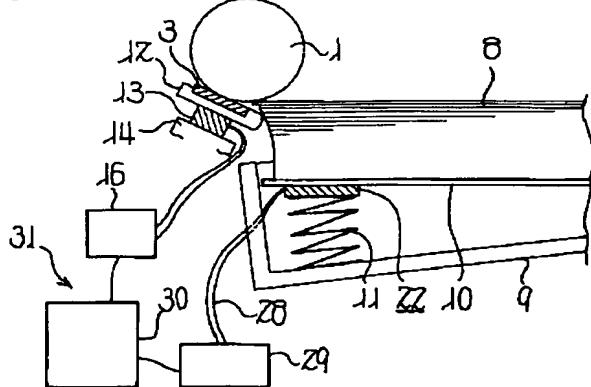
[Drawing 1]



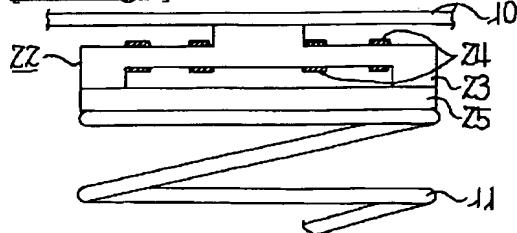
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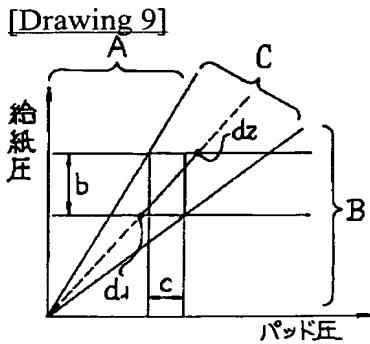
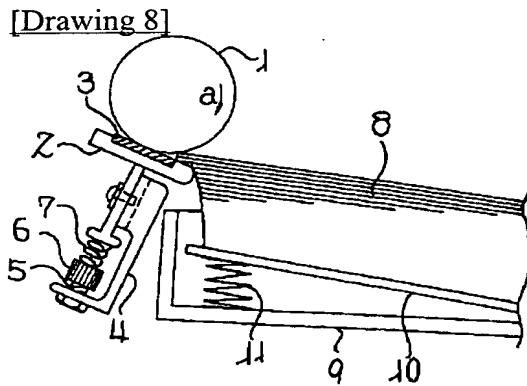
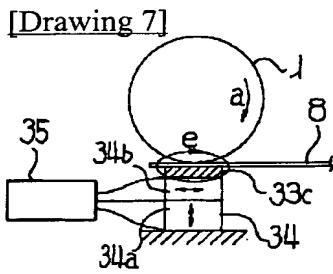
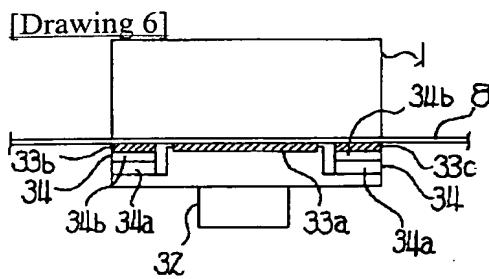
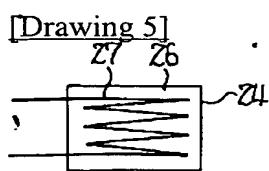


[Drawing 3]



[Drawing 4]





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